

FINAL TECHNICAL REPORT

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Mapping Jets and Eddies in an Eastern Boundary Current

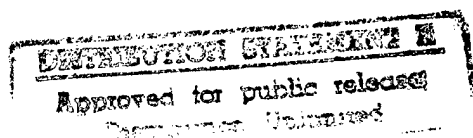
A high-resolution upper-ocean survey of a strong cyclonic meander and an adjacent cyclonic eddy in the California Current region near 38°N, 126°W was conducted in the summer of 1993. Temperature and salinity were measured from a SeaSoar vehicle, and velocity was measured by a shipboard acoustic Doppler current profiler (ADCP). The survey covered a 100 by 70 km region and was conducted during 29 June to 3 July 1993. SeaSoar derived density data show a strong density front at a depth of 70-100 m with strong cyclonic curvature. The corresponding geostrophic velocity fields, referenced to the ADCP data at 200 m, show a swift surface-intensified jet (0.8-1.0 m/s) that follows the density front through a cyclonic meander. Relative vorticities within the jet are large, ranging from $-0.4f$ to $+1.0f$, where f is the Coriolis parameter.

The SeaSoar density and ADCP velocity data are used to diagnose vertical velocity via the Q-vector form of the quasigeostrophic omega equation. The diagnosed vertical velocity field shows velocities of 30-40 m/day. The lateral distribution of relative vorticity and vertical velocity is characterized by patches with length scales of 20-30 km. Geostrophic streamline analysis of vertical velocity indicates that water parcels make net vertical excursions of 20-30 m over 2-3 days, resulting in net vertical velocities of 10-15 m/day. Water parcels moving along geostrophic streamlines experience maximum vertical velocities in regions of maximum alongstream change in relative vorticity, an indication of potential vorticity conservation.

This was the first diagnosis of vertical velocity from direct, high-resolution, synoptic density and velocity data from the California Current region. Comparisons of these direct estimates with vertical velocities inferred from tracer transport and from numerical models are good. Vertical motions associated with mesoscale circulation features have important consequences, in terms of net vertical transport, for the biology and chemistry of eastern boundary current regions.

LIST OF PUBLICATIONS

- Huyer, A., J. A. Barth, P. M. Kosro, R. K. Shearman and R. L. Smith, 1997. Upper-ocean water mass characteristics of the California Current, summer 1993. *Deep-Sea Res.*, in press.
- Shearman, R. K., J. A. Barth and P. M. Kosro, 1997. Diagnosis of the three-dimensional circulation associated with mesoscale motion in the California Current. *J. Phys. Oceanogr.*, submitted.



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